6. (original) A method as claimed in claim 5, where in the etching is performed in a manner which forms a ridge structure in the deposited waveguide layer.

7. (currently amended) A method as claimed in ~~any one of the preceding claims~~ claim 1, wherein the method further comprises a step of creating a refractive index variation in the deposited waveguide layer so as to form a non-constant refractive index profile in the waveguide layer.

8. (original) A method as claimed in claim 7, wherein the step of creating the refractive index variation comprises exposing the deposited waveguide layer to radiation so as to induce refractive index changes in the deposited waveguide layer.

9. (currently amended) A method as claimed in claim 1 ~~any one of the preceding claims~~, wherein the waveguide layer further comprises a dopant material.

10. (currently amended) A method as claimed in claim 1 ~~any one of the preceding claims~~, wherein the deposited waveguide layer further comprises at least partially-oxidised silicon.

11. (currently amended) A method as claimed in claim 1 ~~any one of the preceding claims~~, wherein waveguide layer is deposited by plasma-enhanced chemical vapour deposition (PECVD).

12. (currently amended) A method as claimed in claim 1 ~~any one of the preceding claims~~, wherein the step of forming the waveguide further comprises forming a taper in an end portion of the deposited waveguide layer for facilitating optical coupling to an optical fibre.

13. (original) A method as claimed in claim 12, wherein the step of forming waveguide further comprises creating a variation of refractive index of the deposited waveguide layer in the end portion of the waveguide.

14. (original) A method as claimed in claim 13, wherein the step of creating the variation of refractive index in the end portion comprises carrying out controlled oxidation of the end portion.

15. (original) A method as claimed in claim 14, wherein the controlled oxidation comprises using a laser to heat the deposited waveguide layer.

16. (original) A method as claimed in claim 15, wherein the laser comprises a CO_2 laser.

17. (currently amended) A method as claimed in claim 1 ~~any one of the preceding claims~~, wherein the method further comprises a step of forming an optical signal processing element in and integrated with the deposited waveguide layer.

18. (original) A method as claimed in claim 17, wherein the processing element comprises a photodetector incorporating a dopant material in the silicon-based waveguide structure.

19. (original) A method as claimed in claim 18, wherein the processing element is arranged to be controlled electrically to change its refractive index.

20. (original) A method of coupling a silicon-based waveguide to an optical fibre, the method comprising:

- oxidising the silicon-based waveguide in an end portion thereof so as to alter a refractive index of the end portion; wherein the end portion is arranged to facilitate optical coupling of the waveguide to an end of an optical fibre, the oxidation being controlled so as to create a refractive index profile in which the refractive index at an outer end of the end portion matches that of the optical fibre.

21. (original) An optical device incorporating a silicon-based waveguide structure formed on a substrate, the device comprising a processing element formed and integrated with the silicon-based waveguide structure, wherein the silicon-based waveguide structure incorporates an amorphous-silicon-based waveguide layer.

22. (new) An optical device as claimed in claim 21, wherein the processing element is a thermally activated processing element.

23. (new) An optical device as claimed in claim 21, wherein the amorphous silicon based waveguide layer is formed by chemical vapour deposition (CVD).

24. (new) An optical device as claimed in claim 21, wherein the amorphous silicon based waveguide layer is formed by plasma enhanced chemical vapour deposition (PECVD).

25. (new) A method of forming a high-optical-confinement waveguide structure, the method comprising:

forming a silicon based waveguide on a substrate by depositing a waveguide layer comprising amorphous silicon onto the substrate by a process that does not utilise ion bombardment of target material;

wherein the waveguide layer has a refractive index which is greater than a refractive index of the substrate.

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICANT:	Michael BAZYLENKO et al.	)
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TITLE: WAVEGUIDE STRUCTURE AND METHOD OF FORMING THE WAVEGUIDE STRUCTURE

THE COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, VA 22313-1450

CLEAN CLAIMS

1. (currently amended) A method for forming a high-optical-confinement waveguide structure, the method comprising:

- forming a silicon-based waveguide on a substrate by depositing a waveguide layer comprising amorphous silicon onto the substrate by chemical vapour deposition (CVD);

wherein the waveguide layer has a refractive index which is greater than a refractive index of the substrate.

2. (original) A method as claimed in claim 1, further comprising a step of depositing a first layer of a first material on a wafer so as to form the substrate prior to depositing the waveguide layer.

3. (original) A method as claimed in claim 2, wherein the wafer comprises a silicon wafer.

4. (currently amended) A method as claimed in claim 2, wherein the first layer is silica-based.

5. (currently amended) A method as claimed in claim 1, wherein the step of forming the silicon-based waveguide further comprises etching the deposited waveguide layer.

6. (original) A method as claimed in claim 5, wl erein the etching is performed in a manner which forms a ridge structu in the deposited waveguide layer.

7. (currently amended) A method as claimed ir laim 1, wherein the method further comprises a step of creating a refractive ind x variation in the deposited waveguide layer so as to form a non-constant refra tive index profile in the waveguide layer.

8. (original) A method as claimed in claim 7, wl erein the step of creating the refractive index variation comprises exposing the d posited waveguide layer to radiation so as to induce refractive index changes i the deposited waveguide layer.

9. (currently amended) A method as claimed ir laim 1, wherein the waveguide layer further comprises a dopant materi l.

10. (currently amended) A method as claimed ir laim 1, wherein the deposited waveguide layer further comprises at lea t partially-oxidised silicon.

11. (currently amended) A method as claimed ir laim 1, wherein waveguide layer is deposited by plasma-enhanced chemical v pour deposition (PECVD).

12. (currently amended) A method as claimed ir laim 1, wherein the step of forming the waveguide further comprises forming a aper in an end portion of the deposited waveguide layer for facilitating optical co pling to an optical fibre.

13. (original) A method as claimed in claim 12, v herein the step of forming waveguide further comprises creating a variation o efractive index of the deposited waveguide layer in the end portion of the waveguide.

14. (original) A method as claimed in claim 13, v herein the step of creating the variation of refractive index in the end portion c mprises carrying out controlled oxidation of the end portion.

15. (original) A method as claimed in claim 14, v herein the controlled oxidation comprises using a laser to heat the depo ted waveguide layer.

16. (original) A method as claimed in claim 15, v herein the laser comprises a CO_2 laser.

17. (rrently amended) A method as claimed in claim 1, v erein the method further mprises a step of forming an optical signal processi) element in and integra d with the deposited waveguide layer.

18. (iginal) A method as claimed in claim 17, wherein th rocessing elemen omprises a photodetector incorporating a dopant m erial in the silicon-based v veguide structure.

19. (iginal) A method as claimed in claim 18, wherein th rocessing elemen s arranged to be controlled electrically to change its efractive index.

20. (iginal) A method of coupling a silicon-based waveg le to an optical fibre, th method comprising:

- xidising the silicon-based waveguide in an end porti thereof so as to alter a ractive index of the end portion; wherein the end pc on is arranged to facilitat optical coupling of the waveguide to an end of an op cal fibre, the oxidatic being controlled so as to create a refractive index p file in which the refracti index at an outer end of the end portion matches th of the optical fibre.

21. (iginal) An optical device incorporating a silicon-base waveguide structu formed on a substrate, the device comprising a proc ssing element formed d integrated with the silicon-based waveguide struc re, wherein the silicon- sed waveguide structure incorporates an amorphou silicon-based wavegu e layer.

22. (w) An optical device as claimed in claim 21, wherei the processing elemen s a thermally activated processing element.

23. (w) An optical device as claimed in claim 21, wherei the amorphous silicon sed waveguide layer is formed by chemical vapour position (CVD).

24. (w) An optical device as claimed in claim 21, wherei the amorphous silicon sed waveguide layer is formed by plasma enhanced hemical vapour deposit n (PECVD).

25. (w) A method for forming a high-optical-confinemen vaveguide structu the method comprising:

formir a silicon-based waveguide on a substrate by depos ng a waveguide l er comprising amorphous silicon onto the substrate b a process that does n utilise ion bombardment of target material;

where the waveguide layer has a refractive index which is greater than a refractive in x of the substrate.